2013 BRIDGE COMPETITION GUIDELINES

Designed for grades 6-12.

Middle school teams (Grades 6-8) will not compete against high school teams (Grades 9-12).

** Please limit the number of attendees from each school to a maximum of 20, including teachers, students and chaperones. This is due to space limitations at the facilities where the events will be held.

** Entries that do not meet all construction restrictions will not receive a model efficiency score.**

NO EXCEPTIONS!

Please note the following **MAJOR** changes to this year's guidelines:

- Submit ONLY hard copies (4 total) of the design drawings and written reports.
- Minimum clear span of 14". Maximum bridge length of 16”.
- Laminated members are not allowed.
- Members may not be wider than 1/8” or deeper than 1/8”.
- The bridge deck must extend the entire length of the bridge.
- PowerPoint presentations are not permitted at the regional competitions.

The object of this competition is to design, construct and test the most structurally efficient model truss bridge using the following specifications.

Construction Restrictions

1. The materials used in the construction of the bridge shall consist only of commercially available balsa wood and glue.
2. Any type of bonding material (glue) may be used.
3. A bridge may not be coated with any material (i.e. paint, stain, or glue).
4. The bridge shall contain no member wider than 1/8" nor deeper than 1/8". This member size requirement does not apply at the intersection of members. Gussets, dowels and mitered joint connections are allowed, but only at the joint areas. They can be no thicker than 1/8"

and no larger than ½” square inch in area. Individual members shall be constructed of a single piece of balsa wood. Laminated members are not allowed.

5. The bridge must have a minimum clear span of 14" between supports. The bridge shall be a minimum of 2" wide and must allow a 2" x 2" cube to be passed along the length of the bridge. The maximum length of the bridge shall be 16". Your bridge must allow a 3” x 3" cube to be passed beneath the bridge at mid-span, measured above the support surface. The bridge shall be freestanding. With the exception of the opening for testing purposes, the bridge deck must extend the entire length of the bridge.

6. There must be an opening at mid-span in the bridge deck to allow for testing. A 2" x 2" opening is suggested. (See photo below of a bridge being tested.)

TESTING

A container will be suspended from the opening at the mid-span of the bridge bottom chord, and sand will be added at a slow, steady rate until the bridge collapses or the maximum load of **20 kg** is reached.

ADDITIONAL REQUIREMENTS

1. Draw a diagram of your bridge to full scale. This can be done by hand or by using a computer program. Submit 4 hard copies.

2. Using your diagram, create a model of your bridge from your materials.

3. Write a 2-3 page essay that includes:

    - Research on bridge building history and construction.
    - Identification of career areas used in the design and construction of bridges.
    - Definition and incorporation of the following vocabulary in the essay text:

Compression	**Joint**	**Engineer**	**Live Load**	**Span**
Tension	**Truss**	**Top Chord**	**Bottom Chord**	**Dead Load**

Students also may incorporate the following questions:

- Why do we need bridges? What purpose do they serve?

- How are bridges able to hold the tremendous amount of weight they hold?
- Why is it important to know whether parts of a bridge will be subjected to tension or compression?
- What is a polygon?
- Why is a triangle the strongest polygon?
- Why is it important to first create a blueprint and model of a bridge before the actual construction begins?
- What materials are essential to design a scale drawing or blueprint?
- What geometric shapes did you use in the bridge model? Why?
- How does the strength of the bridge compare to the weight of the bridge?
- What should you do to design a bridge for the future?
- How can computers help design bridges?

For information about bridges, we recommend the following web site - Building Big Bridges. You can learn general information about bridges by viewing the “Bridge Basics” section and learn more about the forces that act on a bridge by viewing the “Forces Lab” section. The web site also includes information about significant bridges throughout history.

JUDGING CRITERIA

A panel of judges will evaluate the bridge model using the following criteria:

Teams can receive a maximum score of 30 out of the following three categories.

Oral Presentation (Score 1-10)

You are promoting the bridge you designed and built to your client -- the judges. Demonstrate knowledge of bridge design and construction. In the oral presentation, describe the chosen design and explain the rationale behind the bridge design. Presentations at both regionals and finals may not exceed seven (7) minutes including set up and break down.

Remember, PowerPoint Presentations are not permitted at the regional competitions.

Written Report (Score 1-10)

The report must be written according to the guidelines outlined in the bridge model requirements. It must also include your research information.

Design Drawing (Score 1-10)

All bridge models must be accompanied by a full scale drawing or blueprint of the bridge according to the guidelines in the bridge model requirements.

MODEL EFFICIENCY SCORE

The model efficiency score is determined independently from the three categories above.

Efficiency score equals **0.035** times the weight carried, divided by the weight of the bridge.

The maximum weight carried by the bridge will be **20 kg**. If the bridge carries more than **20kg**, only **20 kg** will be used to calculate the model efficiency score. **No additional credit will be given for carrying more than 20 kg.**

The calculated model efficiency score will then be added to the number from the oral, written, and design drawing scores to create a total score.

The winning bridge will be the model with the highest combined score from the four categories.

****Decisions made by competition judges and testers are final. There is no dispute resolution process; however, input for process improvement is encouraged.**